

## Ionic Liquid Epoxy Composite Cryotanks, Phase I

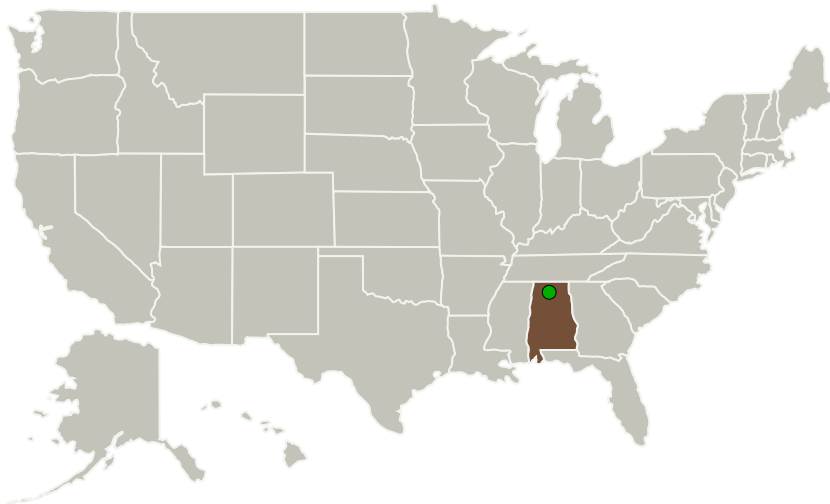
Completed Technology Project (2011 - 2011)



## Project Introduction

The objective of this work is to determine the optimal process for manufacturing lightweight linerless cryogenic storage tanks using ionic liquid epoxy composite material that can compete with metallic tanks currently in use. Ionic liquids, because of their unique properties such as low volatility, low flammability, and flexibility of chemical design are showing promise as the next generation of chemical reagents. Mechanical and chemical testing to date has shown that this IL epoxy monomer, when cured with a commercial aromatic diamine curing agent, yields a polymer resin with high tensile strength, excellent bond strength to aluminum and steel, high toughness, low CTE, and low moisture permeability. Performance comparisons of the ILE to several commercial epoxies showed the ILE had superior tensile and bond strengths. Of particular importance is that these properties of the ILE were even better at cryogenic temperatures because of the low crystallinity inherent in the polymer as a consequence of the chemical nature of ionic liquids. In this Phase I effort, a battery of tests will be carried out at room and liquid nitrogen temperatures on coupons prepared preferably on a filament winder using the wet winding technique. Hand layup may also be used to make small defect-free samples. Samples for tensile, lap-shear and bend (for interlaminar shear strength) will be cut from these. Potholing or surface degradation, microcracking and delamination will be reported and quantified if found.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
AZ Technology, Inc.	Lead Organization	Industry Veteran-Owned Small Business (VOSB), Women-Owned Small Business (WOSB)	Huntsville, Alabama
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

## Primary U.S. Work Locations

Alabama

## Project Transitions

**February 2011:** Project Start**September 2011:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138236>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

AZ Technology, Inc.

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Mark S Paley

**Co-Investigator:**

Mark S Paley

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## Technology Maturity (TRL)

Start: **3**  
Current: **4**  
Estimated End: **4**



## Technology Areas

### Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - └ TX12.1 Materials
    - └ TX12.1.2 Computational Materials

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System